

The main control circuit is adapted to receive data from the plurality of sensors and to automatically operate the drilling machine in response to the data.

Ward discloses a moling system capable of giving mole location and depth measurements. The Ward system includes a mole 10 having a radio sonde 30 and an above-ground receiver 22, 50 and 52. The radio sonde 30 has two energized transmitter coils which emit signals indicative of the mole's roll orientation and depth. Coils in the receiver 50 and 52 are used to detect the fields generated by the coils in the sonde 30. In one mode, fields are measured at the receiver 50 and 52 and the depth of the sonde 30 is estimated. In a second mode, fields are measured and roll data is obtained. A converter 81, housed within the receiver, is used to convert the information carrying signals to a digital format. The converter 81 outputs the information as a 12-bit binary output which is used to drive a roll angle display. The depth and roll information obtained in Ward is only provided at the receiver for benefit of the operator 24, and no automatic control is suggested. There is no disclosure in Ward of a control system for use in operating the moling system. The system of Ward does not include a main control circuit adapted to receive data from a plurality of sensors and to automatically operate the drilling machine in response to the data as found in Applicant's claim 1. Consequently, claim 1 is **not** anticipated by Ward, and the Section 102(b) rejection of this claim must be withdrawn.

The Examiner rejected claims 1-3, 7-11, 21, 23-25, 28-42, 53, 54, and 56¹ under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 6,296,066 B1 issued to Terry et al. Reconsideration of this rejection is respectfully requested.

Claim 1 is directed to a horizontal drilling system comprising a horizontal drilling machine and a machine control system adapted to operate the drilling machine. The drilling machine comprises a drill string with a first end and a second end, a drive system connectable to the first end of the drill string, and a downhole tool connectable to the second end of the drill string. The drive system is adapted to advance the drill string through the earth. The machine

¹ The recitation of the §102(e) rejection did not include claims 53, 54, and 56. However, the Examiner did include these claims in the discussion of the prior art. Applicants have addressed these claims as though they were likewise rejected under §102(e).

control system comprises a plurality of sensors and a main control circuit. The plurality of sensors are each positioned to sense data relative to at least one of a plurality of parameters defining the operation of the drilling machine. The control circuit is adapted to receive data from the plurality of sensors and to automatically operate a drilling machine in response to the data.

Terry discloses a system for creating a well using a bottom hole assembly 30 supported on the downhole end of a composite umbilical work string 20. The system shown in Terry is for drilling wells in the oilfield industry; not for use as a horizontal drilling system or with horizontal drillhole as the claims of Applicants' invention require. The bottom hole assembly 30, disposed entirely at the downhole end of the work string 20, drills the well bore and comprises a power section 90 and an umbilical propulsion system 120. The Terry invention requires use of an umbilical work string 20 comprising flexible, coiled tubing. Using an inchworm technique, the umbilical propulsion system 120 advances the bottom hole assembly 30 along the well, pulling the umbilical work string 20 into the hole as the drilling operation proceeds. The system of Terry does not disclose the system of Applicants' claim 1, requiring a drive system connectable to the first end of the drill string and a downhole tool connectable to the second end of the drill string.

Claims 2-3 and 7-11 depend from claim 1 and include all of its features. Thus, the dependent claims likewise are allowable over Terry, and the Section 102(e) rejection of claims 2-3 and 7-11 must be withdrawn.

Independent claims 21, 23, and 25 are each directed to a horizontal drilling system comprising a horizontal drilling machine and a machine control system. The drilling machine of each claim comprises a drill string having a first end and a second end. A drive system is connected to the first end of the drill string and a downhole or underground tool is connected to the second end of the drill sting. The machine control system is adapted to automatically operate automated functions of the drilling machine.

As previously discussed, Terry discloses a system for creating a well using a bottom hole assembly 30 supported on the downhole end of a composite umbilical work

string 20. The system of Terry discloses an innovative umbilical work string 20 that is pulled into the borehole as the bottom hole assembly 30 advances itself into the borehole. Terry does not disclose a drill string with a drive system connected to a first end of the drill string and the downhole tool connected to the second end of the drill string. Rather, Terry teaches that the propulsion system and the cutting tool are both located at the downhole end of the umbilical 20. Terry does not disclose or teach the horizontal drilling machine of the Applicants' invention as required by claims 21, 23, and 25. Therefore, claims 21, 23, and 25 are not anticipated by Terry, and the Section 102(e) rejections of these claims must be withdrawn.

Claims 28-42 depend either directly or indirectly from claim 25 and include all of its features. Thus, these dependent claims are likewise allowable over Terry and the Section 102(e) rejection of claims 28-42 must be withdrawn.

Independent claim 24 is directed to a method for using a horizontal drilling machine having a plurality of automated functions. The horizontal drilling machine comprises a drill string to which an underground tool is attached. The method comprises selecting a path along which the underground tool is to be used and axially advancing the drill string to move the underground tool, while automatically operating the automated functions of the drilling machine.

Terry, as previously discussed, discloses a system for creating a well bore using a bottom hole assembly 30 supported on the downhole end of an umbilical work string 20. The bottom hole assembly 30 of Terry is used for drilling the well bore and comprises a power section 90 and an umbilical propulsion system 120. At the downhole end of the borehole, the power section 90 and the umbilical propulsion system 120 advance in the borehole, pulling the umbilical 20 into the borehole behind the assembly. The method of the present invention, on the other hand, calls for the drill string to be advanced, resulting in the underground tool being moved along the selected path. Terry does not disclose a method for axially advancing a drill string along a selected path, so as to move the underground tool along the path. Thus, claim 24 is not anticipated by Terry, and the Section 102(e) rejection of this claim must be withdrawn.

Claims 53, 54, and 56 depend directly from claim 25 and include all of its features. Thus, these dependent claims are likewise allowable over Terry and the Section 102(e) rejection of these claims must be withdrawn.

Claim Rejections Under 35 U.S.C. § 103

The Examiner rejected claims 4-6, 26-27, 43-52, and 55 under 35 U.S.C. §103(a) as being unpatentable over Terry in view of U.S. Patent No. 5,996,710 issued to Jansson et al. Reconsideration of this rejection is respectfully requested.

Claims 4-6 depend from claim 1. Claims 26-27 depend from claim 25. Claims 43-52 depend from claim 23. As discussed above, claims 1, 23, and 25 are patentable over Terry. Terry discloses a well boring system comprising an umbilical work string 20 that is pulled into the borehole using a bottom hole assembly 30. Terry touts the advantages of the umbilical work string 20 over a conventional multipipe drill string. *See* col. 5, lines 10-30. Terry teaches away from using a drill string with rigid pipe or made up of multiple lengths of steel pipe. The flexible umbilical disclosed in Terry is needed to implement the complex multilayered work string having conduits that convey data and power to the bottom hole assembly. *See* Fig. 3. With the Terry invention, connecting and disconnecting steel joints making up a drill string is not required.

Jansson shows a drilling device for use with a conventional drill string made up of multiple drill string elements. The drill string in Jansson requires handling to connect drill string elements together. There is no suggestion in Terry to use the drill string shown in Jansson because that drill string would destroy the benefits of Terry's umbilical work string. Terry's discussion of "pipe handling" is only with regard to pipe casings installed in the finished borehole. *See* figs. 11 and 12, and col. 26, lines 14-57. The completion assembly 240 shown in Terry is used to install pipe casings to reinforce the walls of the borehole, not to handle joints of pipe that form the drilling string. It would be inconsistent to attempt to combine Terry with Jansson, suggesting that the drill string and pipe handling system of Jansson could replace the umbilical work string 20 of Terry. Thus, the combination of Terry and Jansson cannot support a

prima facie showing of obviousness as to claims 1, 23, and 25, and these claims are patentable over Terry in view of Jansson. Likewise, dependent claims 4-6, 26-27, and 43-52 are patentable over Terry in view of Jansson and the §103(a) rejection of these claims must fail.

Claim 55 depends from independent claim 24 and includes all of the limitations thereof. Claim 24 has been shown to be patentable over Terry because Terry does not disclose a method for axially advancing a drill string from the uphole end so as to move an underground tool along a selected path. As described above, suggesting that Terry could be combined with Jansson so that the umbilical work string 20 of Terry could be replaced with the pipe handling system from Jansson is nonsensical. Terry extols the virtues of the umbilical work string 20 and using the Jansson system with Terry would obscure the benefits of the Terry system. Therefore, the combination of Terry with Jansson fails to render claim 24 obvious, and claim 24 is allowable over these references. Likewise, dependent claim 55 is patentable over Terry in view of Jansson and the §103(a) rejection of these claims must fail.

Applicant submits that the application is in condition for allowance. A Notice of Allowance courteously is solicited. Applicant's attorney would welcome the opportunity to discuss the case with the Examiner in the event that there are any questions or comments concerning the application or this Response.

This is intended to be a complete response to the Examiner's Office action mailed January 30, 2002.

Respectfully submitted,

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